seem that a star of the fifth magnitude became invisible with a three-feet telescope when at a distance of six minutes from the planet; whilst by the latter the same star, after having undergone occultation by the planet, could not be perceived with a large telescope till Mars had receded from it a distance equal to two thirds of his own diameter; although with the same instrument stars of similar magnitude might be easily distinguished even when in contact with the moon's limb.

As opposed to these observations, the author advances his own. One, dated Blackman-street, February 19, 1822, in which a star of the ninth magnitude as seen with the five-feet equatorial suffered no diminution of its apparent magnitude, at a distance of 103 seconds from the planet. A second, on the night following, when the star 42 Leonis having been seen within a second of a degree of the planet's limb prior to occultation by the planet, was perceived after emersion, when only one second and one tenth from it; the instruments of observation in this instance were the five-feet equatorial and the thirty-inch Gregorian reflector, the former instrument being used by the author, the latter by Mr. Henry South. The third was made at Campden Hill, on the 17th of March of the present year, with an eight-feet achromatic of six inches aperture; and in this the star 37 Tauri was with a power of 320 seen actually touching the planet's limb.—The star in neither instance suffered more diminution of brightness than might fairly be attributed to the diffused light of the planet.

From these observations, and the apparently contradictory ones of Cassini and of Rœner, the author of this paper infers, that the existence of the extensive atmosphere of Mars is a subject highly meriting further investigation.

He then directs attention to the fact that 37 Tauri was of a red colour when in contact with Mars; whilst 42 Leonis was under similar circumstances of a blue colour: and, from inferences dependent upon observation, states, that the apparent anomaly is easily reconcilable, and that an hypothesis is not wanted to account, on the occasion alluded to, either for the red colour of the one star, or the blue colour of the other.

A paper was read "On the Inflexion of Light." By John Barton, Esq. Communicated by Davies Gilbert, Esq. V.P.R.S.

The design of the author in undertaking the experiments of which he gives an account in the present paper, is to carry on the investigation of the phenomena of the inflexion of light from the point at which it was left by Newton. He begins by examining these phenomena in their simplest form, comparing the appearance of the shadow of an opaque body on a screen of white paper at different distances, with the appearance it would exhibit if the rays passed by the edge of the body, without suffering any deviation from a rectilinear course. It is well known that, under these circumstances, the real shadow is broader than the geometrical shadow, indicating a deflexion of the rays from the edge of the

intercepting body. By varying the distances at which the observations are taken, it is found that the rays are not bent at a sharp angle, but pursue a curvilinear course, the concavity of which is towards the shadow, the curve itself resembling an hyperbola. A luminous halo also appears beyond the shadow; the breadth of this halo agreeing accurately, at all distances, with the space which the penumbra should occupy, if the rays were not bent. The author thinks it impossible to reconcile the explanation of these phenomena given by Newton, with his own hypothesis concerning the action of solid bodies on light, as stated in the "Principia:" for, in that hypothesis, the rays passing nearest to the edge of an intercepting body are supposed to be bent towards the edge, as if attracted; whereas the explanation proceeds upon the supposition that they are bent from that body, as if repelled. The actual hyperbolic course of the rays is also inconsistent with that hypothesis, which would assign to them a parabolic path. It also appears that the breadth of the spectrum made by receiving the sun's rays through an aperture one tenth of an inch, or more, in width, is less than if the rays proceeded in straight lines; but if the aperture is very much diminished, the result is reversed, the real spectrum being broader than the geometrical spectrum.

The author conceives, that the whole of the observed phenomena will admit of explanation, by assuming that light consists of material particles, endowed with a power of mutual repulsion, in which case they would obey the laws of elastic fluids; and the course of the rays might admit of comparison with the motions of the particles of air, or other similarly constituted fluids, in flowing past an obstacle opposed to their progress. He shows how this hypothesis furnishes an explanation of the deflexion of the rays, and of the curvature of their path; and why that path resembles an hyperbola. He supports this theory by the analogy of the laws of heat, considered as the properties of a material fluid, with those of light; both exhibiting the phenomena of reflexion, refraction, and polarization. The author is inclined to believe that, besides the deflecting force, the presence of which is already established, there exists also an inflecting force, which bends some of the rays towards the intercepting body; and states a variety of considerations in support of this fact. He explains, on the same principles, the phenomena described by Newton under the appellation of *fits of easy reflexion and easy transmission*, which Dr. Young has explained on the undulatory theory, by the principle of interferences: but which may be considered as analogous to the alternating movements of elastic fluids striking against an opposing body, or entering by a narrow aperture; movements which, in air, give rise to vibrations constituting musical sounds.

The Society then adjourned over the Long Vacation, to meet again on the 17th of November.